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SPACE FABRICATION DEMONSTRATION SYSTEM

QUARTERLY PROGRESS REPORT NO. 10

September 16, 1979 - December 15, 1979

NASA-MSFC Contract NAS8-32472

(NASA-CR-161704) SPACE FABRICATION  
DEMONSTRATION SYSTEM Quarterly Progress  
Report, 16 Sep. - 15 Dec. 1979 (Grumman  
Aerospace Corp.) 11 p HC A02/MF A01

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CSS-SFDS-18001  
Contract NAS8-32472  
January 3, 1980

National Aeronautics and Space Administration  
George C. Marshall Space Flight Center  
Marshall Space Flight Center, Alabama 35812

Attention: Erich E. Engler, COR  
Code EP-13 Bldg. 4610

Subject: SPACE FABRICATION DEMONSTRATION SYSTEM -  
Quarterly Progress Report No. 10  
September 16, 1979 - December 15, 1979

References: (a) SFDS Monthly Progress Letter No. 21  
September 16, 1979 - October 15, 1979  
(b) SFDS Monthly Progress Letter No. 22  
October 16, 1979 - November 15, 1979

Enclosure: (1) SFDS Induction Fastening

**SUMMARY**

During this reporting period, the Space Fabrication Demonstration System (SFDS) program activity included:

- o Composite Beam Cap Fabricator - This development effort, conducted at Goldsworthy Engineering Incorporated was completed within cost and close to the objectives of the abbreviated goals agreed to July 18, 1979 at NASA-MSFC. The final review meeting was held October 24, 1979. Detail associated with the above is detailed in previous monthly and quarterly reports including references (a) and (b). The final report submitted November 30, 1979.
- o Flight Experiment Analysis - This effort directed at design and analysis of flight weight primary and secondary beam builder structure has proceeded according to plan. The effort has currently been curtailed due to funding limitations imposed with the authority to proceed August 1, 1979. Mechanical and structural preliminary

design layouts and the subsystems requirements document are being completed. Details of these items have been reported in references (a) and (b). Without additional funding, this effort will be terminated during the next reporting period.

- o Induction Fastening - These efforts implemented during this quarterly reporting period have proceeded satisfactorily within cost and schedule. Details are included in references (a) and (b) as well as enclosure (1).

The periodic telecons and meetings between cognizant program personnel have continued to assist in timely problem definition, discussion and resolution. These have definitely been instrumental in keeping the program on target in achieving process development and general beam builder objectives within cost.

## DISCUSSION

### WBS 1.1 PROGRAM MANAGEMENT

Figure 1 remains unchanged from that reported in reference (b). We continue to wait for NASA-MSPC direction on final process forming and fastening demonstrations, and structural testing of these or acceptance of the final report on the Composite Beam Cap Fabricator development effort submitted November 30, 1979.

Figure 2 shows that the efforts associated with the Flight Experiment Analysis is on schedule. As noted above, we have curtailed this effort at this point and will not proceed beyond the completion of the preliminary mechanical and structural design layouts and subsystems requirements document. Any further effort will be held in abeyance until additional funding is released toward this contract effort. Consequently, the effort completion date will also slip on a month by month basis.

Figure 3 shows that the effort planning for the Induction Fastening effort is on schedule. This effort, detailed in references (a) and (b) and enclosure (1), is within target cost.

## WBS 1.2 DESIGN AND DEVELOPMENT

The Goldsworthy effort was completed during this quarterly period and will no longer be reported on in this line item.

The design and analysis effort associated with the Flight Experiment Analysis was reported on during this quarter in reference (a) and (b). Only the preliminary design layout effort and subsystem requirements document are continuing as required.

The design of the test apparatus associated with the Induction Fastening effort was completed during this quarter and reported in references (a) and (b). No further design or development effort is required at this time. Therefore, this effort will no longer be reported under this line item.

## WBS 1.3 FABRICATION AND ASSEMBLY

The Goldsworthy effort was completed during this quarterly period. It will no longer be reported upon under this line item.

There is no effort associated with the Flight Experiment Analysis under this line item.

The test apparatus associated with the Induction Fastening effort was completed during this quarter and reported upon in reference (b). Therefore, it will no longer be reported upon under this line item.

## WBS 1.4 TESTS

The Goldsworthy effort was completed during this quarter and reported on in references (a) and (b). This effort will no longer be reported under this line item.

There is no testing associated with the Flight Experiment Analysis under this line item.

Testing associated with Induction Fastening has been reported in reference (b) during this quarter. Test efforts are continuing and should be completed during the next reporting period. Additional data is discussed in enclosure (1).

CONCLUSIONS

Efforts at Goldsworthy Engineering Incorporated have been completed. We wait for further direction on the incomplete items noted above and in reference (b) or acceptance of the final report as noted above.

The Flight Experiment Analysis effort has proceeded satisfactorily, but will remain curtailed until further funding is made available to complete the effort.

The Induction Fastening effort is proceeding satisfactorily and remains within cost and schedule constraints.

RECOMMENDATION

NASA-MSFC respond to request for direction, acceptance and/or concurrence with the program observations made above in connection with:

- o Composite Beam Cap Fabricator development effort
- o Flight Experiment Analysis preliminary design effort

Continued close surveillance of all program elements by all cognizant program and project personnel.

Should you have any question with regard to the above, the enclosure or the SFDS program in general, please contact us.

Very truly yours,

GRUMMAN AEROSPACE CORPORATION



Walter K. Muench  
SFDS Program Manager

WKM:kf

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# SFDS COMPOSITE BEAM CAP FABRICATOR

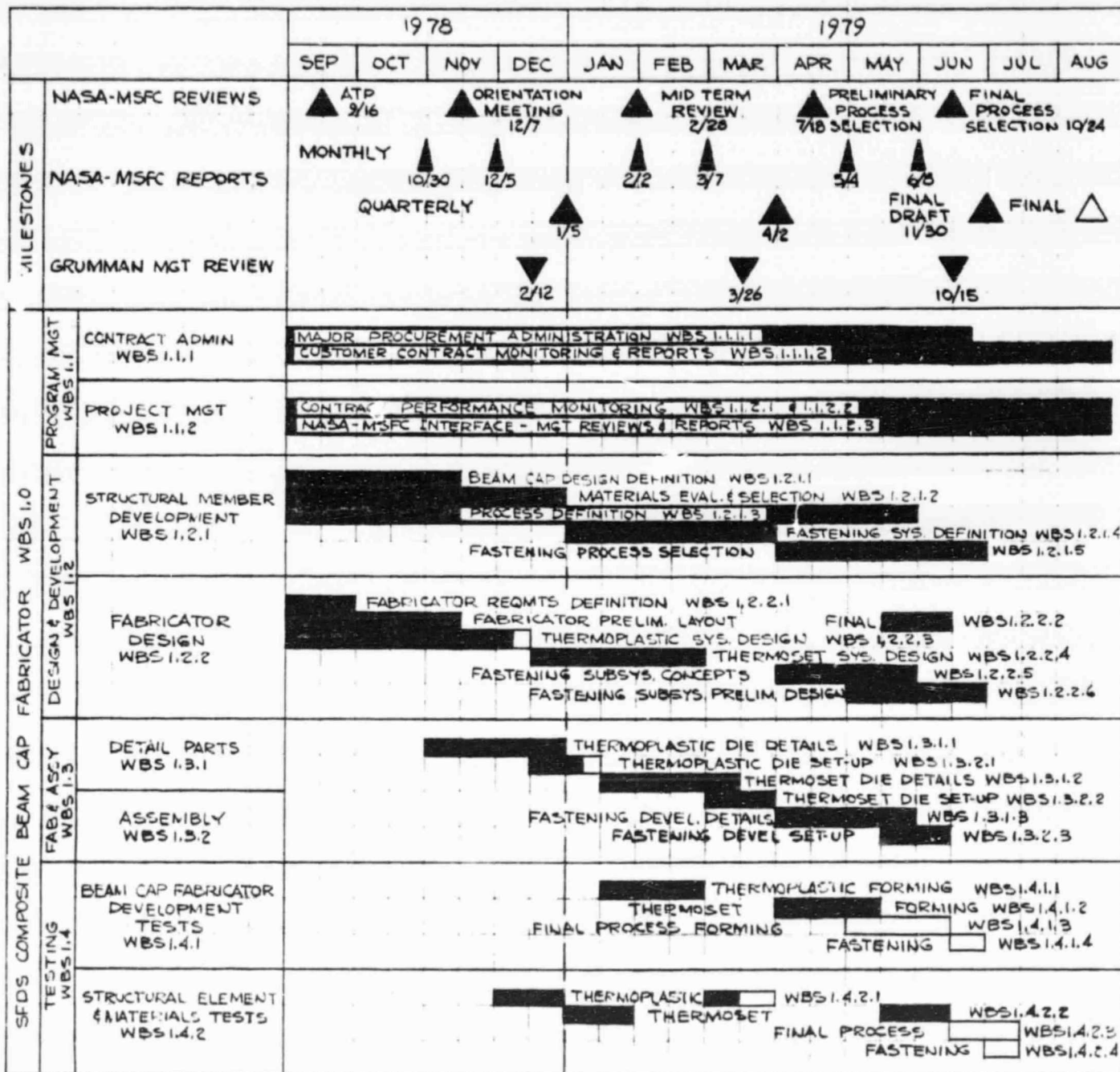


FIGURE 1 - Status of 12/15/79

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# SFDS FLIGHT EXPERIMENT ANALYSIS

• SCHEDULE

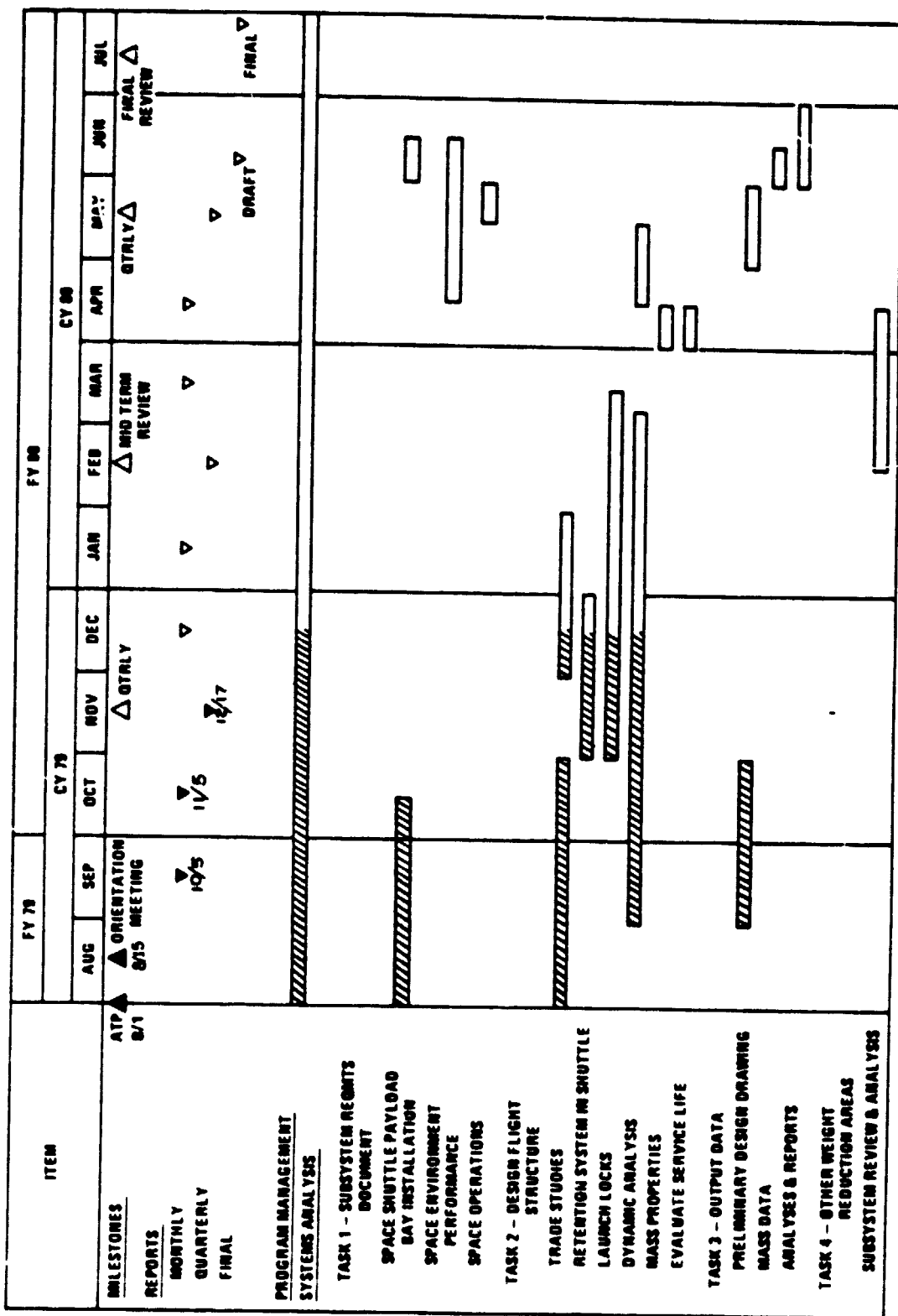


Figure 2 Status 12/15/79

# SCHEDULE FOR INDUCTION WELDING OF COMPOSITES

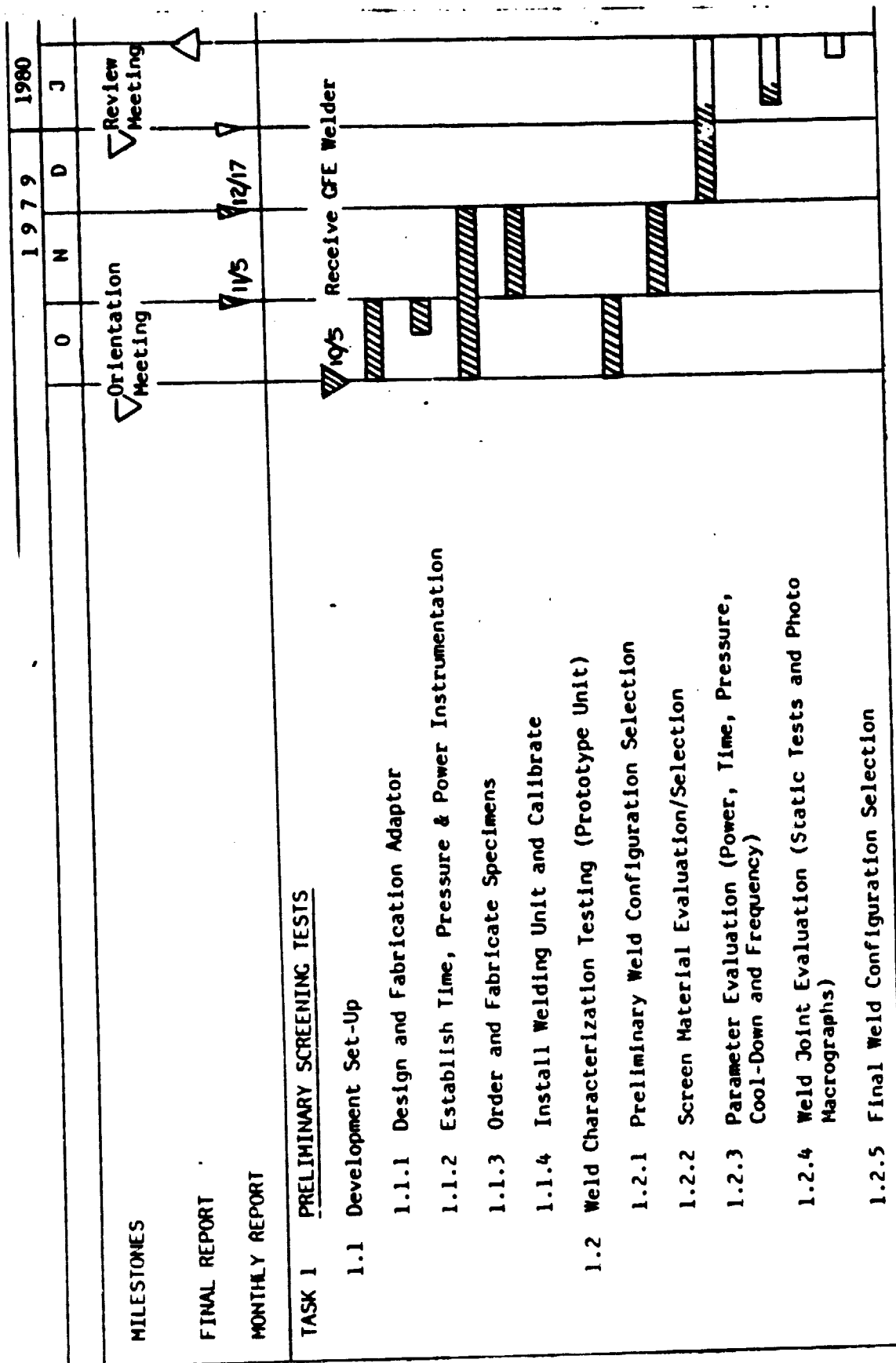


Figure 3 - Status 12/15/79

ENCLOSURE (1)

INDUCTION FASTENING

## INDUCTION FASTENING OF GRAPHITE REINFORCED COMPOSITES

Test of the LARC prototype induction welder is continuing in an instrumented test stand. This test stand is comprised of a Dumore drill press (air over oil feed for variable applied loads) and a dynamometer to measure actual welding loads. The dynamometer output signal is fed to a Brush strip chart recorder for permanent record. The supplied LARC induction welder has typical operating characteristics of 120 K-Hertz and 60 watts power.

Continued testing has shown that the interface screening must be well impregnated with resin to ensure proper flow when bonding graphite/acrylic lap shear samples. Specimens have also been prepared from 0.030-inch thick graphite/polyethersulfone for future induction fastening evaluation. These samples will differ from the graphite/acrylic in that polyethersulfone film will be used in conjunction with steel screening at the lap shear interface.

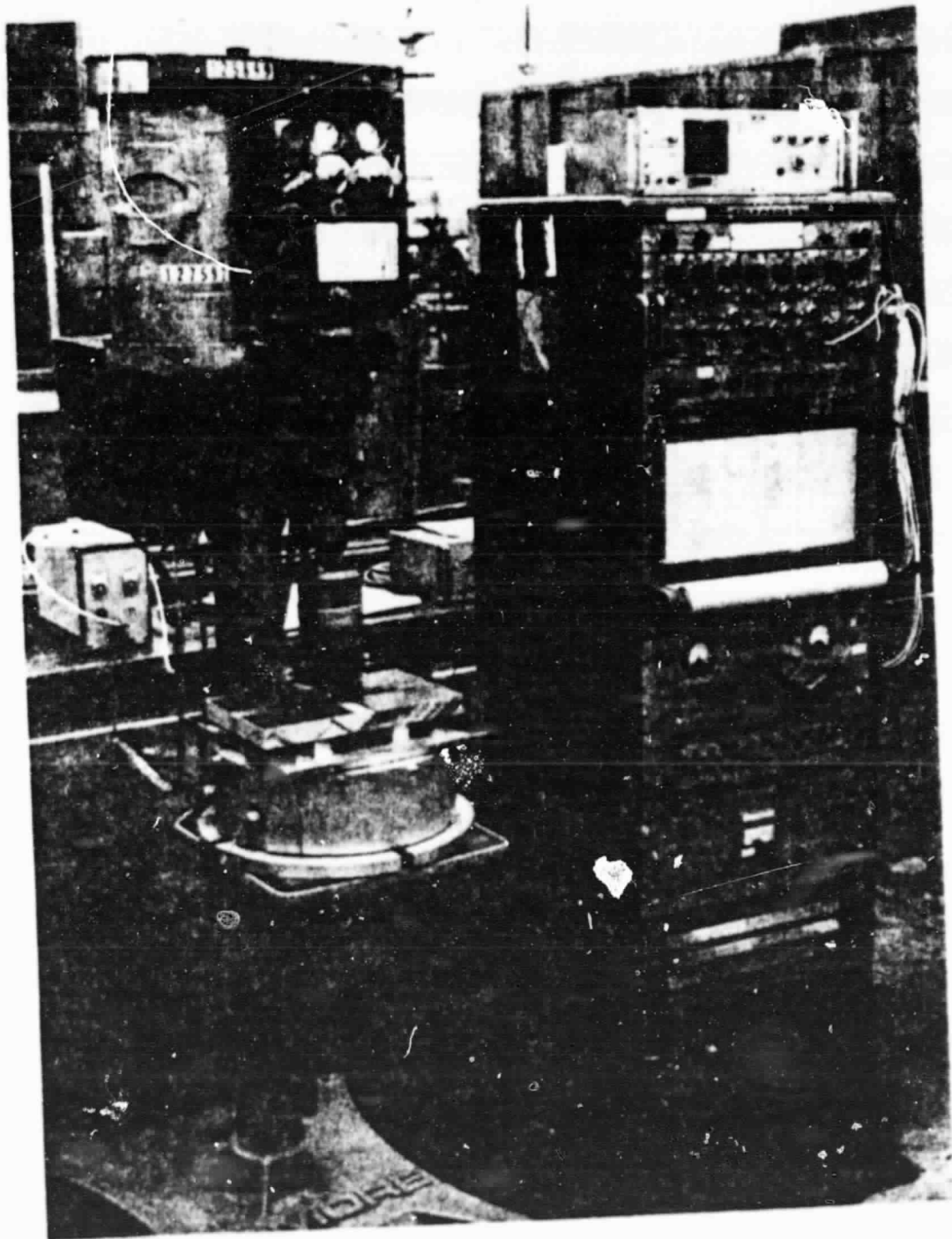


FIG. 1

INDUCTION FASTENING SYSTEM TEST STATION

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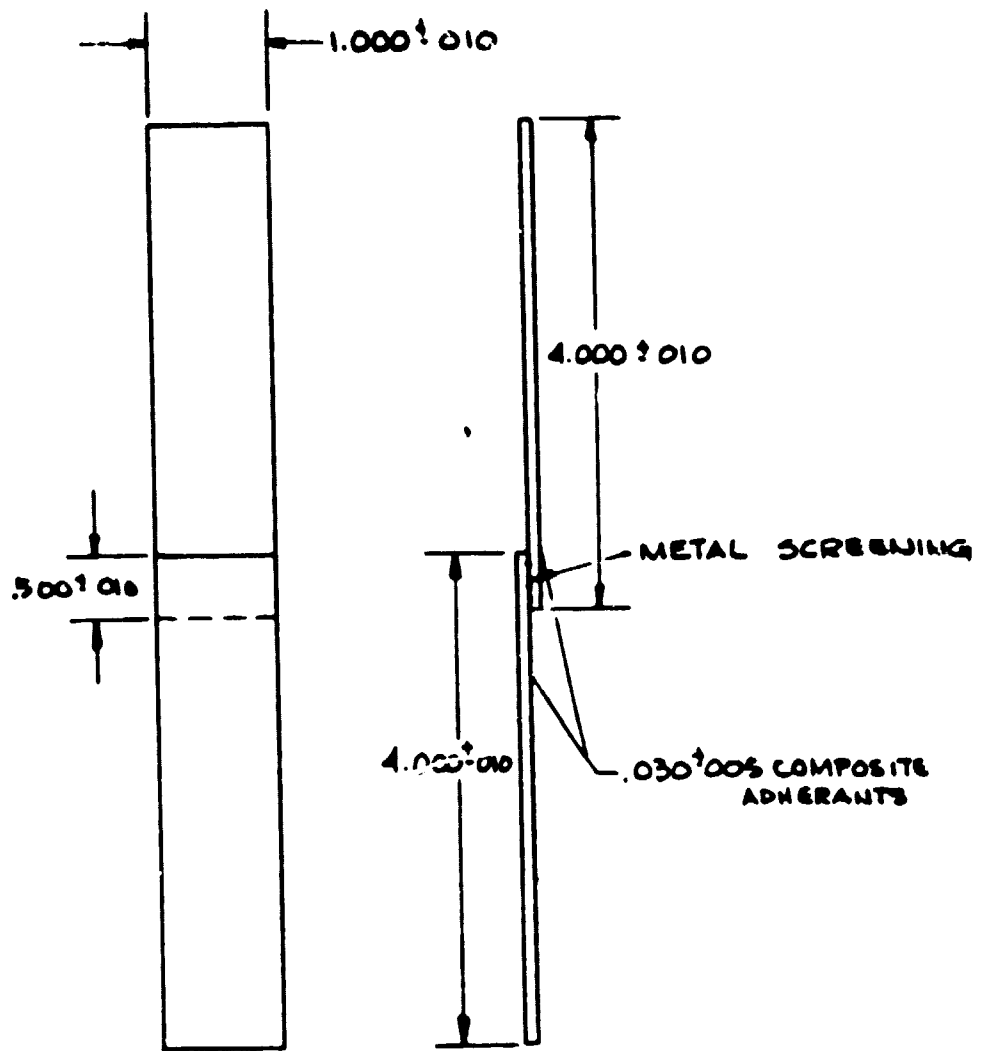


FIGURE - 2 - LAP SHEAR TEST CONFIGURATION